REMARKS

Claims 1-9 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Applicants traverse the rejection of Claims 1-9 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicant regards as the invention.

The Examiner asserts that the specification does not reasonably convey to one skilled in the art how the rotor tends to rotate relative to the stator to a position that maximizes the inductance of an energized winding or how a drive circuit energizes the winding wire around the stator based on the rotational position of the rotor.

Applicants respectfully submit that the characteristics that are described by the above-identified passages are common to (or inherent characteristics of) one type of non-segmented switched reluctance machines. Therefore, these teachings are well within the knowledge of skilled artisans and are of the type that need not be explained further.

Furthermore, Applicants described the operation of several types of non-segmented switched reluctance motors in the Background:

> Reluctance motors are conventionally used as fan motors. Reluctance motors produce torque as a result of the rotor tending to rotate to maximize the inductance of an energized winding of the stator. As the energized winding is electrically rotated, the rotor also rotates in an attempt to maximize the inductance of the energized winding of the stator. In synchronous reluctance motors, the windings are energized at a

> controlled frequency. In switched reluctance motors, control circuitry and/or transducers are provided for detecting the angular position of the rotor. A drive circuit energizes the stator windings as a function of the sensed rotor position. The design and operation of switched reluctance fan motors is known in the art and is discussed in T.J.E. Miller, "Switched Reluctance Electric Motors and Their Control", Magna Physics publishing and Clarendon Press, Oxford, 1993, which is hereby incorporated by reference.

Paragraph [0009] of Applicant's specification. Note that T.J.E. Miller, "Switched Reluctance Electric Motors and Their Control", Magna Physics publishing and Clarendon Press, Oxford, 1993 was incorporated by reference to further support the known operation of non-segmented stator switched reluctance machines.

For the foregoing reasons, Applicants respectfully submit that the rejection under 35 U.S.C. § 112 is now moot.

REJECTION OF CLAIMS 1-9 UNDER 35 U.S.C. § 103

Applicants traverse the rejection of Claims 1-9 under 35 U.S.C. § 103(a) as being unpatentable over Tang (U.S. Pat. No. 5,929,590) in view of Muller (U.S. Pat. No. 4,698,542) and Yamazaki (U.S. Pat. No. 6,127,753).

None of the references show, teach or suggest a switched reluctance fan motor including a stator with circumferentially-spaced stator segment assemblies.

The Examiner expressly admits that Tang does not show, teach or suggest a fan and a shaft connected to the fan. The Examiner expressly admits that Tang does not show, teach or suggest a stator of a switched reluctance machine including a plurality of circumferentially-spaced stator segment assemblies each with a stator core and winding wire wound around the stator core.

While Muller shows a fan and a shaft connected to the fan, the Examiner tacitly admits that Muller does not show, teach or suggest a switched reluctance machine with a circumferentially segmented stator.

The Examiner incorrectly asserts that Yamazaki "shows a switched reluctance fan motor including a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stator segment core and winding wire wound around the stator segment core for the purpose of decreasing size."

Contrary to the Examiner's statements, Applicants respectfully assert that Yamazaki does not mention the use of the disclosed stator in a fans or fan motors. Yamazaki also does not state that the segmented stator can be used in switched reluctance machines either.

The facts in this case are contrary to the Examiner's assertion that it would be obvious to combine the references that are identified above. Despite the existence of two separate teachings (switched reluctance motors and segmented stators in non-switched reluctance motors) for over 70 years, no one has made the combination. Applicants admit that the mere age of the references is a factor but is not, standing alone, persuasive of nonobviousness absent further evidence that the art tried and failed to solve the problem notwithstanding knowledge of the references. See In re Wright, 569 F.2d 1124, 193 USPQ 332 (CCPA 1977); In re McGuire, 416 F.2d 1322 163 USPQ 417 (CCPA 1969).

As will be described below, references teaching both switched reluctance motors and segmented stators of non-switched reluctance motors have been around for a long time. In addition, the problem of sensing rotor position in switched reluctance

machines has also been around for a long time; yet, no one has used segmented stator switched reluctance machines to solve the rotor position sensing problem until Applicants.

The teachings (switched reluctance motors and segmented stators in non-switched reluctance motors) are old. For over 160 years, machine designers have employed a non-segmented stator in switched reluctance machines. One of the earliest recorded switched reluctance motors was built by Davidson in Scotland in 1838. "Switched Reluctance Motors and their Control", T. J. E. Miller (Magna Physics Publishing 1993), p. 5 (attached hereto).

Non-segmented stators in switched reluctance machines continued to be used for over 70 years after the use of segmented stators in other types of electric machines. Barr (U.S. Patent No. 1,756,672, which was issued in 1930) teaches a segmented stator for an electric machine to improve the efficiency of the electric machine, but does not disclose the use of the segmented stator in a switched reluctance machine.

Neither the Examiner nor Applicants are able to identify any examples of switched reluctance machines with a segmented stator.

The problem of cost competitive rotor position sensing has been around for a long time as well. The art of switched reluctance motors has been attempting to solve the problem of sensing the rotor position in an economical manner, as described by Applicants in the specification in Paragraphs [0007] to [0014].

The prior art solutions involved the use of a rotor position transducer (RPT) or another physical sensor with a non-segmented stator to sense the position of

the rotor. Paragraph [0008]. The RPTs increased the size and cost of the switched reluctance machines and render the switched reluctance machines too costly to compete from a price standpoint. Paragraph [0012].

Because the cost of rotor position transducers generally places switched reluctance machines at a competitive disadvantage with respect to other types of machines, commercial applications have attempted to use the sensorless approach. This approach derives the rotor position from sensed inductance or other measured parameters. Paragraph [0014].

This approach has also been too costly to compete from a price standpoint. In particular, the electrical characteristics of the non-segmented stators often vary from one pole to another due to the higher tolerances that are produced by conventional non-segmented stator assembly techniques such as needle winding and transfer winding. Paragraph [0053]. The variation in tolerances requires the use of more costly sensing electronics, which, in turn, increases the cost of the switched reluctance machine.

Applicant's primary motivation for segmenting the stator was to improve manufacturing tolerances and the electrical characteristics of the switched reluctance machine. The unconventional approach allowed Applicants to overcome the "practically impossible" (according to T. J. E. Miller ~ see quote below) task of obtaining satisfactory performance while being cost competitive in the marketplace. There is no teaching or suggestion in any of the references that segmenting the stator of a switched reluctance machine would improve the electrical characteristics of the stator and provide more robust sensorless rotor position sensing.

Applicants also proceeded against the conventional wisdom. The absence of segmented stators in switched reluctance machines may be due to one of the key advantages of switched reluctance motors ~ simple construction. Segmenting the stator is contrary to the goal of simple construction. In the Introduction of "Switched Reluctance Motors and their Control", Miller states:

> The geometry [of the switched reluctance motor] is beguilingly simple, and everything about the motor and its control seems at first sight to be a gift to the production engineer. Yet the attainment of good designs and satisfactory performance is practically impossible by traditional design methods.

See Introduction attached hereto. Segmenting the stator clearly increases the complexity of the design, which is counter to the goal of simplified construction (a primary reason for using switched reluctance machines in the first place).

Applicants proceeded against the conventional wisdom to solve the known problem of sensing the rotor position in a cost effective manner. The geometry is no longer "beguilingly simple" as characterized by Miller. Proceeding against the conventional wisdom is also evidence of nonobviousness. Arkie Lures Inc. v. Gene Larew Tackle, Inc., 43 USPQ2d 1294, 1297 (Fed.Cir. 1997); In re Hedges, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986).

For the foregoing reasons, Applicants respectfully assert that claim 1 is allowable over the prior art of record. Claims 2-8 depend directly or indirectly from claim 1 are allowable for the reasons set forth above.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1211.

Respectfully submitted,

Dated: 11/22/02

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